IN THE CLAIMS:

Please cancel claims 1-6 without disclaimer or prejudice and insert new claims 7-26 as follows:

1-6. (cancelled)

7. (New) A method of gradual deformation of a representation generated by sequential simulation, of a stochastic model, which is limited to a Gaussian stochastic model, of a physical quantity z in a heterogeneous medium, in order to constrain the stochastic model which is not limited to a Gaussian stochastic model to a set of data collected in the medium by means of previous measurements and observations, relative to a state or the structure thereof, comprising applying a stochastic model gradual deformation algorithm to a Gaussian vector (Y) with N mutually independent variables that is connected to a uniform vector U with N mutually independent uniform variables by a Gaussian distribution function (G), so as to form a chain of realizations u(t) of vector U, and using these realizations u(t) to generate realizations z(t) of the physical quantity that are adjusted to the data.

8. (New) A method as claimed in claim 7, wherein a chain of realizations u(t) of vector (U) is defined from a linear combination of realizations of Gaussian vector (Y) comprising combination coefficients with a sum of squares of the coefficients being one.

9. (New) A method as claimed in claim 7, comprising gradually deforming the stochastic model not limited to a Gaussian stochastic model representative of the heterogeneous medium simultaneously in relation to the structural parameters and to the random numbers.

10. (New) A method as claimed in claim 8, comprising gradually deforming the stochastic model not limited to a Gaussian stochastic model representative of the heterogeneous medium simultaneously in relation to the structural parameters and to the random numbers.

11. (New) A method as claimed in claim 7, comprising performing a separate gradual deformation of a number n of parts of the stochastic model not limited to a Gaussian stochastic model representative of the heterogeneous medium while preserving continuity between the parts of the model not limited to a Gaussian stochastic model by subdividing the uniform vector U into n mutually independent subvectors.

12. (New) A method as claimed in claim 8, comprising performing a separate gradual deformation of a number n of parts of the stochastic model not limited to a Gaussian stochastic model representative of the heterogeneous medium while preserving continuity between the parts of the model not limited to a Gaussian stochastic model by subdividing the uniform vector U into n mutually independent subvectors.

13. (New) A method as claimed in claim 9, comprising performing a separate gradual deformation of a number n of parts of the stochastic model not limited to a Gaussian stochastic model representative of the heterogeneous medium while preserving continuity between the parts of the model not limited to a Gaussian stochastic model by subdividing the uniform vector U into n mutually independent subvectors.

14. (New) A method as claimed in claim 10, comprising performing a separate gradual deformation of a number n of parts of the stochastic model not limited to a Gaussian stochastic model representative of the heterogeneous medium while preserving continuity between the parts of the model not limited to a Gaussian stochastic model by subdividing the uniform vector U into n mutually independent subvectors.

15. (New) A method in accordance with claim 7, wherein:

the medium is an underground zone.

16. (New) A method in accordance with claim 8, wherein:

the medium is an underground zone.

17. (New) A method in accordance with claim 9, wherein:

the medium is an underground zone.

18. (New) A method in accordance with claim 10, wherein:

the medium is an underground zone.

19. (New) A method in accordance with claim 11 wherein:

the medium is an underground zone.

20. (New) A method in accordance with claim 12, wherein:

the medium is an underground zone.

21. (New) A method in accordance with claim 13, wherein:

the medium is an underground zone.

22. (New) A method in accordance with claim 14, wherein:

the medium is an underground zone.

23. (New) A method for gradual deformation of a realization generated by use of a sequential simulation, of a stochastic model not limited to a Gaussian stochastic model of a physical quantity in a heterogeneous medium, in order to constrain the realization to a set of data collected in the medium by means of previous measurements and observations, relative to the state or the structure thereof, comprising:

a) generating a first uniform realization of at least a part of the stochastic model using a sequential simulation, the first realization corresponding to a realization of a uniform vector and transforming the first uniform realization to a corresponding first Gaussian realization;

b) generating at least a second uniform realization of the part of the stochastic model independent from the first realization, at least one of the realizations corresponding to a realization of the uniform vector, and transforming the at least one second uniform realization to a corresponding second Gaussian realization;

c) linearly combining the first Gaussian realization and the second Gaussian realization, with coefficients of the combination of the first and second Gaussian realizations being such that a sum of squares of the coefficients is equal to 1, transforming the linearly combined Gaussian realization to a combined uniform realization and forming a realization of the stochastic model by sequential simulation with the combined uniform realization;

d) forming an objective function that measure misfit between sets of data computed from the formed realization of the stochastic model representing the physical quantity, and the corresponding data measured from the heterogeneous medium; and

e) minimizing the objective function with respect to the coefficients until obtaining an optimized realization of the stochastic model.

24. (New) A method as claimed in claim 23, comprising:

gradually deforming off the stochastic model representative of the heterogeneous medium simultaneously in relation to structural parameters and to random numbers.

25. (New) A method as claimed in claim 23, comprising:

separately deforming gradually a number n of parts of the stochastic model representative of the heterogeneous medium while preserving continuity between the n parts of the model by subdividing the uniform vector into n mutually independent subvectors.

26. (New) A method as claimed in claim 24, comprising:

separately deforming gradually a number n of parts of the stochastic model representative of the heterogeneous medium while preserving continuity between the n parts of the model by subdividing the uniform vector into n mutually independent subvectors.